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GRAPHIC REPRESENTATION IN GEOGRAPHY.

I.

GEOGRAPHY as taught in the schools today, and as presented in our modern text-books, is almost a new subject. One of the features of the so-called new geography is the prominence given to relief and to the various landscape forms. The surface of the land—that is, the relation of high lands to low lands—is more and more understood to be the key that opens up to the child the whole fascinating subject of geography.

To the children of twenty or thirty years ago the earth must have appeared flat, with a great number of cities scattered about promiscuously and with rivers flowing in all directions. Geography meant a memorizing of the peculiar shapes which this flat land surface assumes in various parts of the earth, and of cities, rivers, and mountain ranges which were distributed without definite relation to the surface itself. Mountain ranges were named, but the child rarely had anything in mind except the caterpillar-like representation of these features on the map. That the land sloped in a certain direction, that a combination of slopes determined the drainage of a country, and that rivers flowed in the valleys; that the coast line presented an infinite variety of form; and that cities and rivers sustained a relation to the surface of the land: that the relief of land to a large extent has determined the history of our country and is shaping its destiny today—these fundamental conceptions did not enter into the geography teaching of a few years ago.

The best means by which a teacher could test the knowledge of her pupils was the outline map. And, according to the condition of geographic study of that time, the outline map had a legitimate place. Through it the child could express his knowledge of a country; the outline was given often with minute details, dots were placed for cities, lines for rivers, and different devices for the representation of mountain ranges. The outline map was almost symbolic of the mental poverty which was the

result of teaching that did not relate geographic facts to the surface of the land.

But, in spite of the fact that physiography, the study of land forms, has revolutionized the teaching of geography, outline maps are still used in our schools. The subject-matter of geography has been enriched, but still the means by which the child is expected to express his geographic knowledge remains the same.

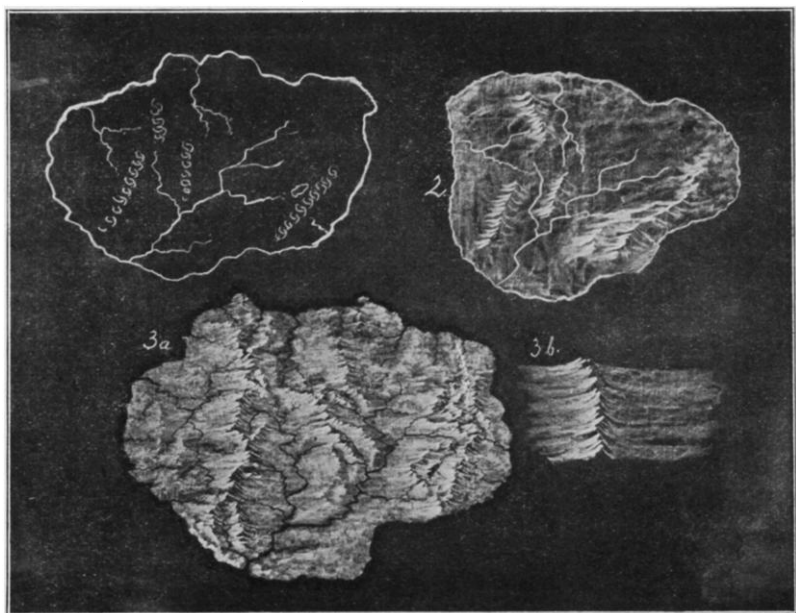
The study of relief, of slopes, river basins, highlands, and lowlands, is a study of form. An adequate expression of such features must, therefore, be through a medium that will express form. Sand and clay are such mediums, and also chalk used on the blackboard. This must not be construed to mean that the outline of a country should receive no attention; it should receive attention, but not exclusively. The outline taken by itself is of little value; it is, in fact, but a frame with the picture left out. Only when the outline suggests to the child the outer edge of the surface of the land, where this sinks below the level of the sea, does it become of importance. The land surface itself, and not its edge, is the great factor in geographic study. If the child knows the direction of the great continental divides, of the highlands and lowlands, the outline will take care of itself, as it is, after all, only the horizontal limits of the solid land surface above the level of the sea.

Of the two mediums sand and clay, sand is by far the more satisfactory in the schoolroom. Sand-modeling should precede chalk-modeling (chalk-relief on the board). As a medium of expressing form, sand is very plastic, and mistakes are easily corrected. Questions of perspective, of light and shade, are entirely eliminated in sand-modeling, while these questions must be considered and understood in the representation of land forms on the board. The child's desire to model in sand is spontaneous and needs no encouragement from the teacher. If the child has modeled mountains, valleys, plateaus, etc., in sand, the representation of these features on paper or on the board becomes an easy matter.

Like sand-modeling, chalk-modeling is a mode of representing relief or surface forms. A series of attempts were made

in the Cook County Normal School, under the direction of the late Colonel Parker, to devise a means that would enable the teacher and pupil to represent forms of land and water on the board, as it was felt that the outline map did not bring out the important facts of the geography of a country.

Figs. 1, 2, and 3 show the development and final result of these attempts. Fig. 1 is the outline map; in Fig. 2 the outline



FIGS. 1, 2, 3a, 3b.

was first made and the land filled in afterward. The mountains and rivers were superimposed on the flat surface. In Fig. 3 the highlands were put in first, and then the lowlands as a continuation of the slopes from the highlands, the outline was omitted as being unnecessary.

In the chalk-modeled relief map, as it finally appeared, are shown:

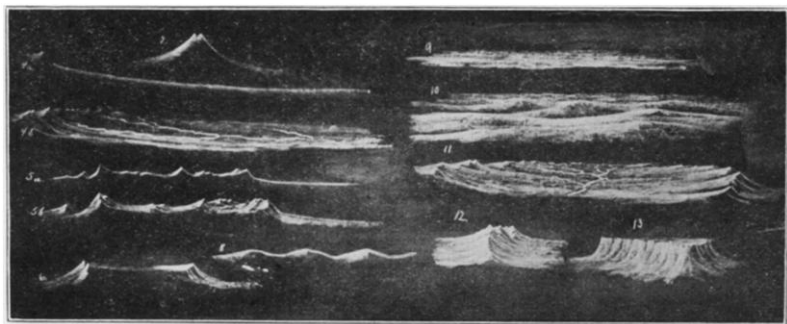
1. The real elevation above the lowlands in the representation of hills, mountains, plateaus.
2. Slopes and combination of slopes into river basins, involving the whole system of drainage.

3. The appearance of the country as a land mass, the edge of which is the outline.

4. The unity of the surface; that is, the intimate relationship between highlands and lowlands.

In Fig. 2, with elevations on a flat surface, points 2 and 4 were not brought out.

It must always be borne in mind that the chalk-modeled map, as here shown, is but a device for the representation of relief, and as such it is being modified all the time. The elevations are conventionalized and exaggerated.



FIGS. 4a-13.

In order to be of real value to the child, the relief map should be preceded by years of close study and modeling of those land features a combination of which constitutes a continent. The relief map may then be taken up in the fourth or fifth grade; if the previous work has been done conscientiously, it will not present great difficulties, as it is in reality but a conventionalized presentation of landscape features on a small scale.

The relief map made by the child should be an expression of his knowledge and feeling of a certain land surface; as such it should show individuality and personal interpretation. It will therefore be different from that of his teacher or from those of his schoolmates. A relief map, if copied, is worse than useless.

In making the map it is important that the child should begin with the highest parts of the land — that is, the divides — and proceed from them to the lowlands (see Fig. 3b). Only in this way

will the unity of the surface be maintained. If a flat surface is made first and the mountains put in afterward, a distinct separation between highlands and lowlands will be the result, and the contrast in color necessary for representation of relief cannot be given.

The only purpose of the chalk-modeled relief is to convey a broad, general impression of the surface conditions (structure) of a country; only the essential, characteristic features should therefore be shown. In the map of South America these great characteristics of the country should find an expression (see Fig. 21) :

1. South America as a great land mass projecting above the surface of the sea. The general shape of the continent.
2. The continuity, unbroken character, and elevation of the western mountain system. The precipitous descent, and the absence of a coastal plain along the Pacific.
3. The high plateau of Titicaca.
4. The eastern highland systems. The broken, irregular, discontinuous character of these highlands, and their comparative low elevation.
5. The great central lowlands.
 - a) Gentle slope from the Atlantic to the foot of the Andes.
 - b) Division into three great river basins: (1) Orinoco, (2) Amazon, (3) La Plata.
 - c) The divides between these basins.

NOTE.—The map should be so made as to show that these rivers and their tributaries must flow in the direction in which they are flowing on account of a certain combination of slopes.

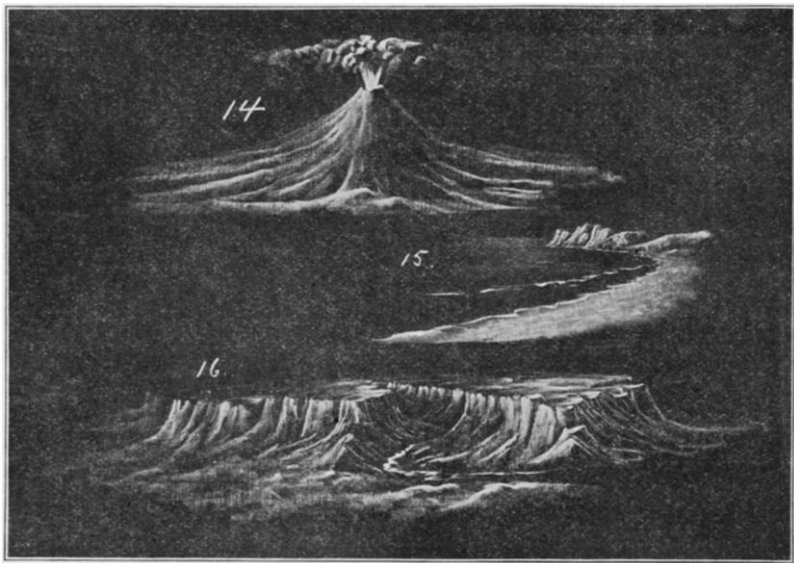
The general but characteristic picture that the relief map gives of the surface should provide the frame into which the child can place and arrange the multitudinous facts and details of geographic knowledge.

The relief map is a symbolic conventionalized representation of surface features and landscape forms. As a symbol it has no other function than to bring out in the child's mind pictures of the real country, and it should therefore not be used until the child is able to interpret its meaning in terms of landscape forms. The map cannot give the child the appearance of rivers, mountains, plains, etc.; the appearance of these features should have been studied previously through observation, pictures, and descriptions.

All that the map can do for the child is to give the extent and distribution of these features on the continent, thus organizing his previous experience of land forms.

In analyzing the map Fig. 21, the following should be noticed:

1. The light comes from the left. This is merely conventional.
2. The strong contrast in light between the two sides of the mountains. This contrast gives relief.



FIGS. 14-16.

3. The high light on the left side of the mountains, the shaded right side of the mountains, and the medium light on the plains.

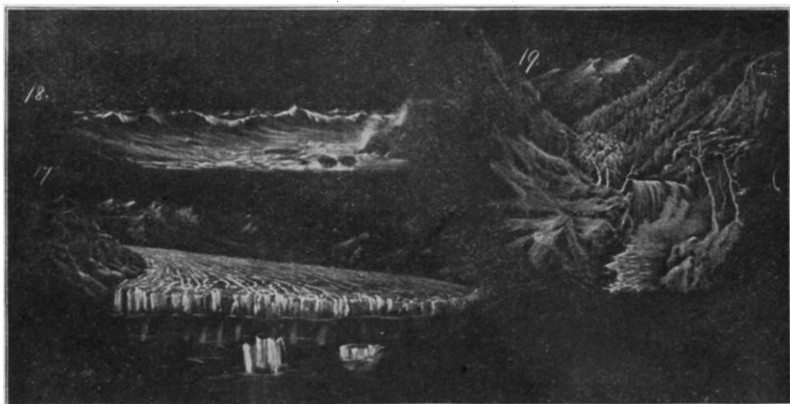
4. Rivers, lakes, and coast line are shown with charcoal. These features should be represented white on paper.

5. More color is given to the more elevated parts of the land. This might be worked up according to a definite scale, and the coloring graded so as to show elevation.

6. Differences in the heights of mountains are shown.

In the representation of relief on the board (chalk-modeling) one point is essential—the slope of the surface. If the teacher can do no more than show the direction of the surface with a stroke or two, a great deal is gained. For this purpose the black-

board should be used continually by teacher and pupils. If, for instance, the western slope of the Mississippi is under discussion, and the teacher tries to bring out the gentle but steady rise of the land from the Mississippi to the foot of the Rocky mountains, a line extending across the entire length of the board will give this fact better than hours of talking (Fig. 4*a*). In the same manner the western plateaus, and their relation to the Pacific on the West and to the great plains on the East, may be shown in a line giving the direction of the surface (Fig. 5*a*). In a similar manner in



FIGS. 17-19.

Fig. 6 the combinations of surfaces in a plateau are shown; in Fig. 7, steep surfaces (mountains); in Fig. 8, rolling surface.

This graphic representation with single lines leads easily to a more complete representation of the surface; for instance, in Figs. 4*b* and 5*b*.

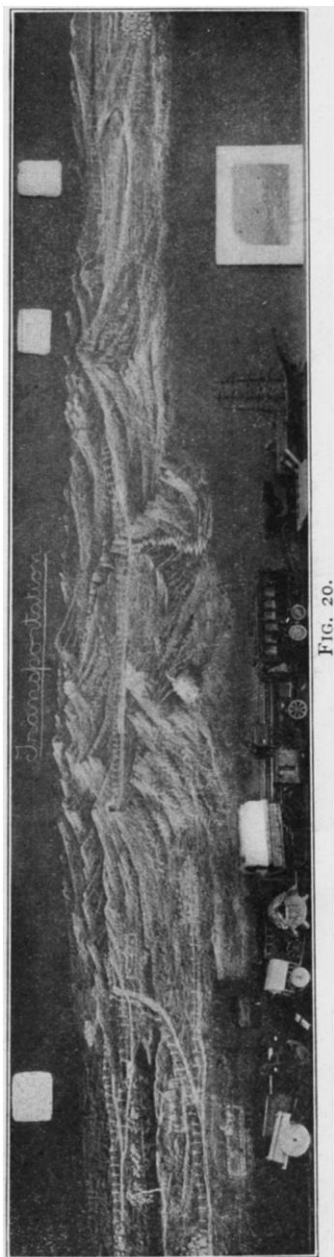
If the various landscape forms are analyzed, it will be seen that their different appearances are principally due to differences in the direction of their surface slopes. For instance, in the level country the horizontal direction predominates; in a cañon two steep surfaces meet a horizontal surface. Fig. 9 shows a level surface; Fig. 10, a rolling, undulating country; Fig. 11, gently sloping surfaces (river basins); Fig. 12, steeply sloping surfaces (mountains); Fig. 13, a steep surface (bluffs and cliffs); Fig. 14, concave surfaces ascending toward one point (volcano); Fig.

16, a combination of horizontal and vertical surfaces—*buttes*, *mesas*. By a combination of these surfaces an infinite variety of land forms may be represented: Fig. 19, *cañon*; Fig. 15, level and vertical surfaces (*beach*); Fig. 16, *cañon* in plateaus.

Chalk-modeling is a representation of mass, and lines should therefore be avoided, except where a detailed analysis of the surface is desired. The broad surface of the chalk should be used and only the essential features of the landscape emphasized.

Another essential point in the representation of surface is texture. Is the surface rocky or sandy, water or land, cultivated or uncultivated, are questions that must be answered. Figs. 15, 18, and 19 show surface or water, horizontal or vertical; Fig. 15 shows sandy surface; Fig. 17, surface of ice; Fig. 19, wooded surface; Fig. 16, rocky surface.

Chalk-modeling may be done on paper as well as on the board. On paper the best medium is charcoal or a very soft pencil. It must be borne in mind, however, that the medium used on the board is white and on paper dark, and that therefore the treatments on paper and on the board differ. It may perhaps be safe to make this general statement concerning the use of the two mediums: In the representation of white or



bright colors, or of light, the white material must be used. This on the paper is the paper itself, and on the board the chalk. For instance, in Fig. 14 the reflection from the molten interior is bright (white), and must be so shown, whether on paper or on



FIG. 21.

the board; similarly, the crests of the waves in Fig. 18, and the snow and ice in Fig. 17. To use here the dark material heavily on paper, as chalk is used on the board, would be to convey wrong ideas. Children will often make such mistakes. In Figs. 9, 10, and 11 the chalk is used more heavily in the foreground to convey distinctness (perspective); and the medium on paper would be used in a similar manner.

In Figs. 9-19 the landscape is shown as it would appear to an observer when looking in a definite direction from one fixed standpoint; this involves perspective. In the map, Fig. 21, the landscape is represented, not as it appears, but as it actually is; that is, perspective is largely eliminated. Fig. 20 is a bird's-eye view of a large section of the country; it is a combination of a picture and a map, in this, that perspective is shown, and that here a much larger stretch of country is sketched than can possibly be seen at one glance. The representation is conventionalized and exaggerated, but at the same time pictorial. As an aid in teaching geography such a bird's-eye view is extremely helpful for showing the relationship and combination of surface features. There is hardly any limit to the extent of surface that may be graphically shown in such a bird's-eye view; it may involve hundreds, even thousands, of miles. The sketch in Fig. 20 was used in connection with a study of transportation in the second grade. The teacher chalk-modeled the surface, and the children were asked to provide railway facilities for towns that were separated by a rough, mountainous country. The children surveyed the country to find the cheapest and best route for the railroad, and then put in the tracks, tunnels, bridges, etc.

The aim in chalk-modeling is not to make finished pictures nor to produce artistic effects, but to describe geographic features clearly, scientifically, and rapidly with the chalk. If this aim is held persistently in view, the result will be "art" as well as geography. Lack of artistic ability is no excuse for a failure to carry on this work in the class-room. What is needed on the part of both teacher and pupils is a definite knowledge of landscape forms and of relief, and a willingness to express this knowledge in an intelligible way.

II.

THE USE AND ORGANIZATION OF PICTURE COLLECTIONS.

The use of pictures in the schoolroom is of great importance. In giving the child vivid images in the various subjects of study, pictures are inferior only to actual observation. A good picture comes next to the real object; by its study more may be learned

about a topic in a few minutes than is possible by hours of book work. But in order to be of value for educational purposes, a picture should be properly studied, and should receive the same attention that is given to the printed page. A picture has a certain story to tell, but unless sufficient time is given, this will not be revealed to the observer. The children should be trained to read a picture as they do a book. They should be led to see that it is not a mere embellishment of the text in the book, but that it is of equal importance with the text. Thus studied, pictures will reinforce all the work of the schoolroom and become an important source of information.

A picture collection may be organized in every school, whether in the city or the country. Hardly any expenditure of money is necessary for this purpose, as the best pictures may sometimes be had free of charge. Every day valuable illustrations pass through our hands to be thrown away or forgotten. Our modern magazine is a storehouse of this kind of material, with its wealth of pictures illustrating every phase of geographic knowledge. Many of these pictures are large, admirably executed, and furnish just the illustrative material which would add life and interest to our teaching. Almost every household has bundles of old magazines, thrown away in some forgotten corner in the garret or the cellar. People are only too glad to get rid of them, and if the teacher would make an appeal to the pupils for old magazines, material with which to start a collection of pictures would come in rapidly. Some of these would be of slight value, but enough would be found to make the trouble worth while. Newspapers, in particular the Sunday editions, also contain excellent illustrative matter. Some of the foreign weeklies, German, English, and French, have very large pictures which, when mounted, are an acquisition for any collection.

Another source from which we may obtain pictures without cost is found in the advertising matter distributed by the different railways, as booklets, folders, and separate pictures. Some of this material is excellent and can be had in great abundance. By visiting the various railway offices a teacher may make a very important addition to her collection and obtain pictures illustrating, not only our own continent, but also foreign countries.

Thus if everybody contributes, teacher as well as pupil, a considerable number of pictures may be obtained within a very short time. Surprisingly large collections have been made in this way, and have proved of such value that the teachers, if deprived of their use, would be very much hampered in their work. In this case, as in so many others, the best educational material can be had free of charge, if the teacher is alert and willing to use that which is near at hand.

The next step in the organization of a collection is the mounting and classification of these pictures. The children will be glad to do the cutting and pasting. If money is not available, sufficient cardboard will usually be found in the school or may be brought by the children. Large pictures should be mounted separately, but smaller ones may be grouped together on the same chart. This grouping should be done according to a certain principle; for instance, pictures illustrative of lumbering may be placed together so as to be a graphic representation of the whole process from beginning to end. Charts illustrating the various industries may thus be worked out. Similarly pictures of a certain city, state, or country may form the material for various charts. This arrangement of small pictures on large pieces of cardboard has many advantages. Where one small picture by itself would mean very little, when grouped with others it reinforces each one in bringing out a certain idea or a certain story. In this way an almost endless variety of charts may be composed out of the heterogeneous material brought in by the teacher and pupils.

These charts should be planned by the children and should be an outcome of their study. If artistically made, they meet two important requirements of schoolroom decoration: they are made by the children, and they reflect the work that is being carried on in the schoolroom. These charts should be kept, and will furnish excellent geographical material for the study of similar topics in the future.

Another suggestion may be given here for the mounting of small pictures. On a large outline map—for instance, of South America—made on cardboard, the small pictures might be placed so as to represent different sections of that continent. The

pictures when in place should form a continuous whole. This work requires care on the part of the children and a thorough knowledge of the country.

If mounted on separate pieces of cardboard, the pictures should be carefully classified according to subjects and topics. No definite classification is suggested; that one should be adopted which seems the most economical and convenient in a certain school. The pictures may be classified under the main heads of "Rivers," "Glaciers," "Industries," "Cities," etc. These may be further subdivided under various topics. They should then be labeled and marked in such a way that a glance is sufficient to determine what they represent and where they belong. Only one thing more is necessary to put the collection in working order — a number of large envelopes. These may easily be made by the children and labeled according to the character of the pictures they are to hold. It is hardly necessary to add that in the use of this collection, as finally organized, the same rules should be enforced that regulate a library.

If the teacher or the school has money for the purchase of pictures, catalogues should be obtained from the various firms which have begun to publish whole series for use in the schools. These series have been very carefully selected, are in all sizes, and sell at very low prices. (See Miss Chisholm's list below.)

To sum up: All that is necessary to organize a collection of this kind is to save the pictorial material that is usually thrown away, to interest the children in its collection, and to have it mounted and so classified as to be of the most effective and economical use in the schoolroom.

The complaint is often heard that the teachers are hampered in their teaching of geography by a lack of material. This complaint may have some justification, as far as books are concerned. As for maps and pictures, there need be no lack of material. The teacher should be able to make her own maps in addition to the meager supply of printed maps; with a knowledge of the country, and with a little practice in chalk-modeling, this is possible.

It has been the experience of the writer that in the school where the teachers work up their own material, that which has

been bought, often at a great expense to the school, is used to a very limited extent. The sand or chalk-modeled map made by the teacher to meet an immediate demand in the schoolroom is far superior to any map furnished from the outside, and the picture collection that has been gathered from all available sources, and that is being constantly enlarged by contributions from teachers and pupils, will be infinitely richer in numbers and variety than any series of pictures published by book companies.

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WHERE TO PROCURE PICTURES.

From the following list of addresses good pictures may be purchased:

The Detroit Photographic Co., Detroit, Mich.: 8x10 inches, 35 cents; larger sizes at different prices; catalogues of either American or foreign scenes, price 10 cents; stereoscopic slides, 40 cents each. All the pictures of the Detroit Co. are good. They are printed in colors. In the collection will be found pictures showing the topography, industries, architecture, and ethnology of India, Egypt, Italy, Spain, Switzerland, France, Norway, Sweden, Holland, Belgium, Germany, Great Britain, United States, Mexico, and other countries. They also carry the well-known W. H. Jackson plates of United States and Mexican scenery. These can be had in plain photographs as well as in colors.

Mr. Elgin R. Shepard, 2931 Portland avenue, Minneapolis, Minn., official photographer for the Great Northern Railroad: 9x11 inches, \$1; slides, 40 cents; catalogues. These are very beautiful photographs and are mounted on good cards. The collection consists of views taken on and near the line of railroad, as well as a number of Alaskan scenes.

Mr. Davis, Honolulu, H. I.: 7x9 inches, 30 cents. Mr. Davis has many photographs of different sizes, varying in price according to the finish desired. This is a good collection of tropical pictures, showing the vegetation, the rice, sugar, coffee, and other industries, and containing also a fine selection of volcanic views.

K. Tammura, 2&16 Benton Dori, Itchome, Yokohama, Japan: Colored photographs; stereoscopic slides. Mr. Tamamura has one of the best collections of photographs of Japan, illustrating the country, its industries, architecture, and ethnology.

Libreria Spithover, 84 Piazza di Spagna, Rome, Italy: 8x10 inches. Photographs of scenery, architecture, and art.

G. Sommer & Figlio, Sargo Vittoria, Piazza Sommer, Naples, Italy:

8x10 inches, 20 cents each, \$1.16 per dozen. A good selection of Italian and Swiss pictures, especially of Pompeii, Vesuvius, and surrounding district.

G. Brogi, Florence, Italy: 8x10 inches, 20 cents each. Pictures of the cathedrals, art, and history.

Alinari & Cook, Corso 137a, Rome, Italy: 8x10 inches, \$1.16 per dozen. Topography of the country and art.

Charles Naya, Place S. Mark N 75-79, Venice, Italy: 8x10 inches, \$1.16 per dozen. Venetian scenes, art, and architecture.

A. Beato, Luxor, Egypt: 7x11 inches, \$1 per dozen; no catalogue. A very good collection, illustrating everything of interest in Egypt.

Aristote Rhomaides, I Place de la Constitution, Athens, Greece: 8x11 inches, 20 cents each. Views of Greece—ruins, monuments, art, and landscapes.

Thomas Paar, Darjelling, India: 7x8 inches, 85 cents per dozen; 8x10 inches, \$1.20 per dozen; no catalogues. Mr. Paar will select and send photographs, if told what is required. His collection contains the best to be had in India.

A. Giraudon, 15 rue Bonaparte, Paris, France: 8x11 inches, 1 franc each. A large collection of art and architecture.

London Stereoscopic Co., Regent street, London, England: 7x11 inches, 36 cents each. English scenery, architecture, art, and industries.

Berlin Photographic Co., Unter den Linden 4a, Berlin, Germany: 7x10 inches, 36 cents; 15x19 inches, 72 cents. A very large collection of photographs, mostly of art.

Erdmann & Schanz, 4 Salcot Road, Bolingbroke Grove, London S. W., England: A large variety of pictures on all subjects.

M. Frankenstein, Vienna, Austria; Stengel & Markert, Dresden, Germany; and Wurthle & Sohn, Salzburg, Austria, all have good photographs of the mountainous districts of the southern part of Europe.

A. Briquet, City of Mexico, Mexico: Large collection of Mexican views.

When pictures are desired of any particular region, they may generally be had if one writes to the proprietors of the large hotels, who usually carry them for the convenience of their guests. Names of the reliable hotels can be obtained from guide-books, such as "Cook's Tours," etc.

The United States government now sends photographers with the surveying parties, and the cuts which appear in the reports may be obtained from the government department, at the bare cost of printing. These cuts vary in size and cost.

The Perry pictures (Boston, Mass.) of art, birds, trees, etc., are too well known to need any explanation.

Stereopticon slides can be had from the following places, in addition to those already mentioned:

Lévy et Fils, 25 rue Louis-le-Grand, Paris, France: Catalogues, sent on application, for almost every country in the world.

Farrar collections (Charles Farrar), Unity Building, Chicago, Ill.: Sets of slides arranged for topical study of countries and cities, with special reference to art and literature. A written description accompanies these slides.

Mr. E. R. Shepard, Minneapolis, Minn., mentioned before, has some on mining, harvesting, milling; price, 40 cents.

John H. Thurston, 50 Bromfield street, Boston, Mass., has slides illustrating nearly every country. Under the direction of the Boston Geography Society, Mr. Thurston has arranged several sets of educational slides. These comprise: rivers, young, mature, old, and underground; swamps; stratification; coastal plains; plains, prairies; mountains; volcanoes; weathering; shore lines, waves, and tides; islands; glaciers; meteorology; agriculture, lumber, cattle-raising; coal, cotton, silk, and fish.

Many of the railroads publish good pictures that may be had for little more than the cost of postage. The Boston & Maine Railroad, Boston, Mass., issues a series of six booklets, containing thirty-one pictures each, at a cost of 6 cents apiece. These are taken from photographs, and give mountain, river, coast, lake, and historical views of New England.

The Northern Pacific, Canadian Pacific, "Frisco Line," and many other railroads, issue booklets full of excellent material for the geography teacher. Some railroads publish monthly magazines — such as *Sunset*, San Francisco, Calif — that give a splendid idea of the sections of our continent traversed by these lines.

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